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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/712,833	11/12/2003	Mark R. Fernald	CC-0676	9515

7590 09/30/2005  
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EXAMINER
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WASHBURN, DOUGLAS N

ART UNIT	PAPER NUMBER
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2863

DATE MAILED: 09/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/712,833	<b>Applicant(s)</b> FERNALD ET AL.	
	<b>Examiner</b> Douglas N. Washburn	<b>Art Unit</b> 2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) 2, 4-8, 10 and 26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 3, 12, 16, 17, 19, 20, 22, 24, 25, 27 and 28 is/are rejected.
- 7) ☒ Claim(s) 9, 11, 13-15, 18, 21 and 23 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 September 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>8 September 2005</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1 The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 12, 16, 17, 24, 25, 27 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Gysling et al. (US 6,732,575) (Hereafter referred to as Gysling).

Gysling teaches:

At least two strain sensors (column 5, lines 46-48; figure 30) attached onto an outer surface of a pipe (figure 30) at different axial locations along the pipe (column 5, lines 46-48; figure 30), each of the strain sensors providing a respective strain signal indicative of a pressure disturbance within the pipe at a corresponding axial position (column 20, lines 21-25), each of the strain sensors comprising a piezoelectric film material (column 20, lines 21-25) having a pair of conductors disposed on opposing surfaces thereof in regard to claim 1;

A piezoelectric film is attached to an outer surface of a pipe (column 20, lines 30-32; figure 30) in regard to claim 1;

A signal processor (column 2, lines 41-43), responsive to strain signals, which provides a signal indicative of at least one parameter of a process flow flowing within a pipe (column 2, lines 41-43) in regard to claim 1;

A piezoelectric film material extends around a substantial portion of the circumference of a pipe (column 18, lines 13-16) in regard to claim 12;

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Strain signals are indication of acoustic pressures propagating within a pipe (column 2, lines 41-43) in regard to claim 16;

A parameter of a fluid is one of steam quality or "wetness", vapor/mass ratio, liquid/solid ratio, volumetric flow rate, mass flow rate, size of suspended particles, density, gas volume fraction, and enthalpy of the flow (steam quality; column 25, lines 12-27) in regard to claim 17;

Each sensor measures an acoustic pressure and provides a signal indicative of an acoustic noise within a pipe (column 2, lines 65 et seq; column 3, lines 1-8) in regard to claim 24;

At least three strain sensors (figure 30) in regard to claim 25;

Strain sensors are mounted to the outer surface of a pipe by an adhesive (column 20, lines 7-20) in regard to claim 27;

And strain sensors include pressure sensors (column 20, lines 28-30) in regard to claim 28.

### ***Claim Rejections - 35 USC § 103***

2 The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 19, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gysling in view of Gysling et al. (US 6,536,291)(Hereafter referred to as Gysling2).

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Gysling teaches:

At least two strain sensors (column 5, lines 46-48; figure 30) attached onto an outer surface of a pipe (figure 30) at different axial locations along the pipe (column 5, lines 46-48; figure 30), each of the strain sensors providing a respective strain signal indicative of a pressure disturbance within the pipe at a corresponding axial position (column 20, lines 21-25), each of the strain sensors comprising a piezoelectric film material (column 20, lines 21-25) having a pair of conductors disposed on opposing surfaces thereof in regard to claim 1;

A piezoelectric film is attached to an outer surface of a pipe (column 20, lines 30-32; figure 30) in regard to claim 1;

And a signal processor (column 2, lines 41-43), responsive to strain signals, which provides a signal indicative of at least one parameter of a process flow flowing within a pipe (column 2, lines 41-43) in regard to claim 1.

Gysling is silent regarding:

A process flow is one of a single-phase fluid and a multi-phase mixture in regard to claim 3;

Strain signals are indication of vortical disturbances within the fluid flow in regard to claim 19;

A parameter of a fluid is one of velocity of the process flow and the volumetric flow of the process fluid in regard to claim 20;

And a signal processor determines the volumetric flow rate of a fluid flowing in a pipe in response to the velocity of the fluid in regard to claim 22.

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Gysling2 teaches:

A process flow is one of a single-phase fluid and a multi-phase mixture (column 2, lines 51-54) in regard to claim 3;

Strain signals are indication of vortical disturbances within the fluid flow (column 2, lines 29-38) in regard to claim 19;

A parameter of the fluid is one of velocity of the process flow and the volumetric flow of the process fluid (column 2, lines 29-38) in regard to claim 20;

And a signal processor determines the volumetric flow rate of a fluid flowing in a pipe in response to the velocity of the fluid (column 16, lines 34-37) in regard to claim 22.

Regarding claim 3, it would have been obvious to one skilled in the art at the time of the instant invention to modify the teaching of Gysling of strain sensors providing a respective strain signal indicative of a pressure disturbance within a pipe with the teaching of Gysling2 of a process flow is one of a multi-phase mixture because strain sensors providing a respective strain signal indicative of a pressure disturbance within a pipe would have been used to determine a flow rate of the fluid.

Regarding claims 19 and 20, it would have been obvious to one skilled in the art at the time of the instant invention to modify the teaching of Gysling of strain sensors providing a respective strain signal indicative of a pressure disturbance within a pipe with the teaching of Gysling2 of measuring unsteady (or dynamic or ac) pressures and extracting the pressure signal indicative of a vortical pressure (or flow) field (or perturbation) because the vortical pressure field would have been used to determine a convection velocity by cross-correlation techniques, such convection velocity being proportional (or approximately equal to) the flow rate of the fluid.

Regarding claim 22, it would have been obvious to one skilled in the art at the time of the instant invention to modify the teaching of Gysling of strain sensors providing a respective strain signal indicative of a pressure disturbance within a pipe with the teaching of Gysling2 of a signal processor determines the volumetric flow rate of a fluid flowing in a pipe in response to the velocity of the fluid because vortical flow disturbances are coherent dynamic conditions that would have occurred in a flow which substantially decay over a predetermined distance and flow at or near average fluid flow velocity and in general, would have been distributed throughout the flow. Therefore, vortical flow fields (and the associated pressure disturbance) convect at or near mean flow velocity.

***Allowable Subject Matter***

3      Claims 9, 11, 13-15, 18, 21 and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

Claim 9 recites, in part, "the piezoelectric film material includes at least one of polyvinylchlorine fluoride (PDVF), polymer film and flexible PZT". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 11 recites, in part, "each of the pairs of the conductors is a coating of silver ink". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 13 recites, in part, "the piezoelectric film material has a thickness greater than 8 mm". This feature in combination with the remaining claimed structure avoids the prior art of record.

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Claim 14 recites, in part, "the piezoelectric film material has a thickness between 8 mm and 120 mm". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 15 recites, in part, "electrical insulator between the piezoelectric film material and the pipe". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 18 recites, in part, "the signal processor determines the slope of an acoustic ridge in the k-w plane to determine a parameter of the process flow flowing in the pipe". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 21 recites, in part, "the signal processor determines the slope of a convective ridge in the k-w plane to determine the velocity of the fluid flowing in the pipe". This feature in combination with the remaining claimed structure avoids the prior art of record.

Claim 23 recites, in part, "signal processor generates a flow velocity signal indicative of the velocity of the fluid flowing within the pipe by cross-correlating the strain signals". This feature in combination with the remaining claimed structure avoids the prior art of record.

It is these limitations, which are not found, taught or suggested in the prior art of record, and are recited in the claimed combination that makes these claims allowable over the prior art.



Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Response to Amendment***

4 Applicant amendment overcomes §101 rejection of claims 1, 9 and 11-25 and the rejection is withdrawn.

Applicant amendment overcomes objection to claim 11 and the objection is withdrawn.

***Response to Arguments***

5 Applicant's arguments with respect to claims 1-27 have been considered but are moot in view of the new grounds of rejection.

***Conclusion***

6 Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas N. Washburn whose telephone number is (571) 272-2284. The examiner can normally be reached on Monday through Thursday 6:30 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on (571) 272-2269. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DNW

  
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